Antecedents of Commitment and Trust in Customer-Supplier Relationships in High-Technology Markets

NORTH-HOLLAND

Antecedents of Commitment and Trust in Customer–Supplier Relationships in High Technology Markets

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The level of complexity and inherent perceived risk involved in customer relationships in high-technology markets leads to an intricate interplay of factors determining commitment and trust that in turn affect customer intentions to remain in the relationship. In this article, we develop a model in which aspects of the product, relationship management activities, and market variables are discerned and taken into account simultaneously as antecedents of trust, commitment, and intention to stay. The results from a qualitative and a quantitative study provide evidence for the influence of types of antecedents of trust, commitment, and intention to stay in supplier–customer relationships in high-technology markets relationships. It is shown that particularly affective commitment plays an important role in these relationships

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INTRODUCTION

Firms operating in high-technology markets must face the demanding challenges of environmental complexity. The complex nature and volatility of high-technology markets create uncertainty and contribute to perceived risk both on the supply and the demand side [1]. Suppliers of high-tech products must cope with the technological skepticism frequently exhibited by buyers who delay or postpone their purchase of the product [2] as well as obsolescence and the threat of competing technologies [3, 4]. Alternatively, buyers in this market often face switching costs resulting from the fact that they have made commitments to a certain technology or a particular vendor [5–7]. As the number of players in high-technology markets is frequently limited, switching barriers as well as interdependence are relatively high [2]. Many buyers are developing single source suppliers [6], and many suppliers are striving for closer ties with their customers [8]. Furthermore, it has been demonstrated frequently that in addition to the high-tech product, both sales person expertise and after-sales support and service and communication effectiveness are essential ingredients for supplier success in high-technology markets [9–12]. Extensive contract negotiations and regular maintenance requirements lead to an atmosphere of multiple interactions between individual buyers and sellers in which communication and cooperation play an important role [13]. This phenomenon has been referred to as the "multiheaded customer and seller" [14].

The level of complexity and inherent perceived risk involved in relationships with customers forces suppliers of high-technology products to allocate investments among various available assets. In addition to product and after-sales service quality, relationship investments have to be made with regards to such matters as account support, conflict regulation mechanisms and increasing switching costs for customers [15]. Apart from monetary returns on investment, a number of nonmonetary returns have been identified in the relationship marketing literature [6]. Particularly, commitment and trust frequently have been identified as essential "relationship building blocks" [16–23]. Both variables have been successfully used as indicators of relational continuity.

However, whereas ample and well-supported models have been developed for identifying relationship success or failure in business relations, empirical knowledge of relationships between firms operating in the environment of the high-technology market has remained relatively scarce [7]. It is not clear how market-, relationship-, and product-related variables influence buyer–seller relationships in terms of commitment, trust, and the intention to continue the relationship in the future. In this article, therefore, we develop and empirically test a model that integrates variables from the environment of high-technology markets with the relationship variables of commitment, trust, and relational continuity.

This article is structured as follows. First, we review the relationship marketing literature with regard to the variables incorporated in our model and discuss their interrelationships. Subsequently, we will report on the results of a study that was conducted to empirically test our model. We conclude with a discussion of the theoretical and managerial implications and directions for future research.

RELATIONSHIP BUILDING BLOCKS: COMMITMENT AND TRUST

The literature on relationship marketing reports extensively on trust and commitment (see e.g. [6, 18–25]). Trust has been conceptualized as the confidence that relationship partners have in the reliability and integrity of each other [21, 24]. Commitment refers to the motivation to stay with a supplier [23] or, as Moorman, Zaltman, and Deshpande [19] state, to an enduring desire to maintain a valued relationship. Kumar, Hibbard, and Stern [22] distinguish two different types of commitment, that is, affective and calculative commitment. Affective commitment expresses the extent to which customers like to maintain their relationship with their supplier. Affective commitment is based on a general positive feeling towards the exchange partner [26]. Calculative commitment, a negatively oriented type of motivation, refers to a firm's motivation to continue the relationship because it cannot easily replace its current partner and because it cannot obtain the same resources and outcomes outside

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its current relationship. This dimension posits commitment as a calculative act in which costs and benefits are examined.

As commitment entails vulnerability, parties will seek only trustworthy partners [21]. It can be argued that trust leads to a high level of affective commitment or, in other words, a strong desire to maintain a relationship [27–30]. Empirical support for this argument is given by Anderson and Weitz [17], Morgan and Hunt [21], and Geyskens et al. [25]. Trust may lead customers to focus more on the positive motivation because of a sense of affiliation and identification with the supplier, and this may be a stimulus to focus less on calculative reasons for attachment to a supplier firm. In addition, Geyskens et al. [25] report a negative relation between trust and calculative commitment. When a firm's trust in a partner increases, there will be less reason to continue the relationship because it feels it needs to on the basis of cost–benefit analyses. Commitment and trust are determined by many antecedents. In the next section, we attempt to structure these antecedents.

ANTECEDENTS OF COMMITMENT AND TRUST

Offer Characteristics

The first type of antecedents pertains to the offer of a supplier of high-technology products, which determines the degree to which customers are able to accomplish their goals and objectives. This reflects a set of variables that have been traditionally associated with supplier selection. The total offering of a supplier consists of the core product and peripheral services [31, 32]. MacKenzie [33] argues that product (functional) performance and outcome quality are essential elements of the core product. Peripheral services are, for instance, after-sales services that are provided as preventive or corrective maintenance on the product (cf. [32]). Offer characteristics thus reflect both functional (product) and intangible (service) characteristics [12]. Traditional marketing mix variables such as price are relatively unimportant in high-technology markets [10]. Increasingly, even manufacturers of tangible core products, such as computers and cars, depend on added-on (after sales) services for a large part of their revenues [10, 12, 34, 35]. Likewise, both perceived product and service have an important impact on immaterial revenues, such as customer trust. In the literature on the marketing of high-technology products, it frequently has been argued that due to the relatively high levels of perceived risk associated with these products, customers' trust plays a pivotal role in supplier selection and patronage [7, 36]. The development of trust depends both on the credibility of product quality and the credibility of service quality [37]. Empirical evidence for the relationship between offer characteristics and customer trust has been provided by MacKenzie [33] who demonstrated that customer trust in the office equipment market is influenced positively by customer perception of product and service performance. The better the perception of the offering, the better promises made to the customers during the presales phse can be kept and the more trustworthy the supplier is in the eyes of the customer. In addition to investments in the total product offering, suppliers are increasingly focusing on relational exchange activities [12]. We will focus on this set of antecedents in the next section.

Relationship Characteristics

The importance of relationships with customers in business markets as part of companies' operating strategies has been widely acknowledged [6, 21, 38–41]. As Wilson [6] puts it "relationships have become strategic and the process of relationship development is accelerated as firms strive to create relationships to achieve their goals" (p. 335–336). As relationship management becomes institutionalized in high-technology firms and emphasis is placed on integrated networks between suppli-

ers and customers, relationship promoters or account managers are appointed, and formal transactions reflect informal and interpersonal agreements and commitments [42, 43]. As Weitz and Jap [39] conclude, the attention to relationship management activities has aptly been reflected by the "work" metaphor: firms are working on their relationships with customers. The second higher order construct reflects activities aimed at maintaining or increasing the level of gains and returns received from relationships with customers. As a result of a focus on interorganizational relationship, much emphasis has been placed on the importance of personal relationships between boundary spanning functions of account and sales management. In high-technology markets, personal contact between supplier and customer is viewed as the most important source of information [10]. Larson [44], for instance, reports that personal relationship management by boundary spanners leads to a reduction of perceived risk and uncertainty and that personal trust is a major consideration for supplier selection. Furthermore, through personal contacts affective commitment can be established. Account support therefore can be considered as an important element.

Communication, the formal and informal sharing of information through frequent two-way dyadic interchanges, also plays an important role in realizing the benefits from a relationship [45]. MacKenzie [33] contends that communication is an aspect that will be considered when relationships are evaluated by customers. Dwyer, Schurr, and Oh [18] argue that communication is an important input to customer commitment. Anderson, Lodish, and Weitz's [16] argument that communication is positively associated with customer trust has been empirically verified by Anderson and Narus [24]. Anderson and Narus state that customers perceptions of trust in a relationship reflect a *present* state whereas the perceived communication and cooperation refer to *past* behavior. This leads us to model cooperation as another antecedent of trust. Cooperation is a frequent phenomenon in high-technology markets. Cooperation has been conceptualized as the coordinated actions taken by partners to achieve mutual outcomes or singular outcomes with expected reciprocity over time [24].

In relationships conflict may occur as a result of disagreement or perceived impediment of the attainment of mutual goals and objectives [18, 46]. Although conflict can have a negative effect on relationships [45], solving conflicts constructively may actually strengthen interorganizational relationships and lead to greater trust and affective commitment [39, 47, 48]. Conflict solving or harmonization of conflict has been described as "a spirit of mutual accommodation" [49] as agreement is sought via informal means and social interaction. It is aimed at reaching mutually acceptable compromises without having to resort to formal procedures and as such an important input to customer commitment [48]. Therefore, harmonization is another important element of the relationship characteristics of marketers of high-technology products. In conclusion, we may state that relationship specific investments often are aimed at achieving positive feelings of affiliation between suppliers and customers of high-technology products and hence lead to increased affective commitment and trust.

Market Characteristics

It has been pointed out that the nature of supplier–customer relationships in high-technology markets is considerably influenced by market characteristics [7, 50–54]. For instance, whether other suppliers in the market form real alternatives to a customer is not only based on the product and services packages offered by these other suppliers in comparison with that of the current supplier, but also on the costs and risks associated with switching from supplier.

Our third higher order construct market characteristic refers to actions and activities that high-technology sup-

pliers may take to increase customer perceptions of dependencies and costs involved in switching. We distinguish three dimensions, that is the replaceability of the supplier, the perceived switching costs, and switching risks. The replaceability component refers to the difficulty of replacing one's partner because of the lack of alternative partners [54]. The switching costs and switching risk refer to the costs expressed as time, efforts, and money and financial risk involved in switching from supplier. Technology-driven markets are characterized by a high level of uncertainty. Rapidly changing technologies and the absence of relevant information for customers are the main sources of this uncertainty [7]. This means that the costs and risks involved in switching from supplier will influence the choice behavior of customers. Suppliers may influence perceptions of replaceability and costs and risks of switching not only by noncompatibility of products but also by developing specific relationship routines and procedures and "vendor-specific learning" [7]. Furthermore, developing supplier-related quality standards has been advocated as an important instrument for lowering switching behavior [36, 55]. Finally, communicating the rapidity of technological developments enables suppliers to close customer consideration sets to competitors [7].

In the relationship marketing literature, it has been argued that the more dependent a customer is on its supplier, the higher motivated the customer will be to develop a strong, cooperative long-term relationship with its supplier (cf. [20]). Kumar, Sheer, and Steenkamp [56] and Geyskens et al. [25] provide empirical evidence for a positive relationship between dependence and affective commitment. Because of relationship-specific investments on the part of the customer, the calculative motivation to continue the relationship will be present as well. Indeed, Geyskens et al. [25] have shown that there is a positive relationship between dependence and calculative commitment. Likewise, because calculative commitment is based on cost–benefit considerations, it has been shown that a positive relationship between perceived switching costs and risk on the one hand and calculative commitment on the other exists in business relationships [57]. The more a customer experiences difficulties with switching, the more the customer feels the need to continue working with the supplier.

CONSEQUENCES OF COMMITMENT AND TRUST: BEHAVIORAL INTENTIONS

Commitment indicates the motivation to maintain a relationship [6, 18, 20, 21, 24, 25]. Commitment has been conceptualised also in terms of a temporal dimension, focusing on the fact that commitment becomes meaningful only when it develops consistently over time [19]. As a result of continuity, customer turnover may be reduced, and partners will be more inclined to work together to achieve mutual goals [24]. Through long-term commitment and trust relationship consequences, such as decreased opportunism, can be realized [21, 48]. Kumar, Hibbard, and Stern [22] use intention to stay in the relationship as an important desirable consequence of commitment that has a direct impact on supplier–customer relationships. Intention to stay reflects the customer's motivation to continue the relationship [22].

Having introduced the concepts of commitment and trust and their antecedents and consequences, we report on the results of two empirical studies that were undertaken to develop and test hypotheses with regard to the aforementioned constructs.

EMPIRICAL INVESTIGATIONS

Research Setting

Two empirical studies were undertaken for the market for very high volume (VHV) copiers in The Netherlands.

Knowledge intensity and perceived uncertainty.

VHV copiers have a minimal speed of 90 copies per minute, varying from 45,000 to 2,000,000 copies on a monthly basis and can be considered as the high-end production machines within the total range of copiers. VHV copiers meet the requirements for high-tech products as defined by Meldrum [36] in the sense that rapid developments take place in a highly technical environment and that a relatively high level of technology-based uncertainty is associated with these products both on the part of the supplier and the customer. Due to rapid developments in digitalization, printer, copying and communication technologies are merging into one type of office equipment. These developments have made VHV copiers complex systems involving a high level of knowledge intensity. Furthermore, the market for very high volume copiers in The Netherlands is highly competitive and saturated as it is dominated almost exclusively by three main suppliers. Typically, customers in this market are copy shops, printing companies, and above all central reprographic units of large organizations (e.g., insurance companies, banks, and educational institutions). For many customers, VHV copiers are an essential part of their core business, as opposed to the low volume copiers that often are considered commodities [36]. The total amount of VHV copiers in The Netherlands is an estimated 3,000. Although the number of placements of VHV copiers is really small compared with the total number of copiers in The Netherlands (approximately 225,000 in 1996), VHV copiers are considered an important segment in terms of investments, revenues, and company reputation.

Study I: Development of Hypotheses

DATA COLLECTION. Since the literature on relationship marketing only provides theoretical and empirical support for the associations of commitment and trust at the level of individual variables (e.g., the effect of dependence on commitment) and not at the level of the higher order constructs, we decided to conduct a relatively large-scale, qualitative study to develop our hypotheses. Fifty-four in-depth interviews were held with customers of the three main suppliers in the VHV market. Interviews lasted between one and two hours. Using a list with discussion points, we focused on customer perceptions of the relationship with their present supplier of VHV copiers, the impact of offer, and relationship and market characteristics on customer perceptions of the relationship as well as choice behavior and expected developments in the market during the interviews. As reprographic units form the largest segment by far in the market for VHV copiers, the majority of respondants (36) consisted of repro-managers. In addition, 10 respondents from printing companies and eight respondents from copy shops participated in the qualitative study.

DATA ANALYSIS. First of all, we focused on customer perceptions of the relationship with their present supplier of VHV copiers. More specifically, trust and commitment in supplier–customer relationships were discussed. The majority of respondents has a relatively high degree of trust in their supplier. It appears that particularly due to relatively high levels of technology-based uncertainty, customers assign considerable value to the development of trust in their supplier of VHV copiers. A number of respondents clearly sees a link between trust and commitment. It is argued that commitment involves a certain degree of risk in high-tech markets and that customers are seeking out suppliers that keep their promises, particularly in the area of after-sales services. Many respondents experience a strong sense of identification and attachment to their supplier of copiers (e.g., “My boss once asked me whether I had shares of that supplier.”). It also is remarked that an atmosphere in which sales and service people of the supplier are open about their own concerns and emphasize cooperative problem solving, together with visits to R&D facilities enhance positive feel-

ings of affiliation. Those respondents that experience lower levels of trust (based primarily on promises that have not been kept in the past or a hard selling attitude and behavior) also indicate that they view their relationship with the supplier as "strictly business-like" or based on extrinsic grounds such as price or specific functional features. Hence, we hypothesize on the basis of our review of the literature as well as the results from the interviews that:

H1: Trust is positively related to affective commitment.

H2: Trust is negatively related to calculative commitment.

The second major focus in the interviews were three types of antecedents and their impact on the central variables of trust and commitment. To begin with, an extensive list of choice criteria for a supplier was elicited during the interviews. Product, product output (copy), and service quality appear to be the most widely acknowledged choice criteria. In addition, reliability of the product and credibility of the supplying firm were frequently mentioned. Relatively many respondents indicate that their business or operations depend on the products and that therefore they must be able to rely on the product and service provided by the supplier. Both product and service quality are essential determinants of customer trust in this market. Hence, we conclude that product and service quality are essential antecedents of customer trust, and we hypothesise that:

H3: The offer characteristics are positively related to trust.

Frequent, informal and open communication in which conflicts are constructively solved with sales representatives and account managers creates a strong sense of positive affiliation and trust. Customers seem to appreciate a proactive attitude on the part of the account executive. As one respondent remarked, "they often ask us for suggestions for improvement and I really have the feeling that this is taken seriously," and another stated that; "new technological developments reach us via our sales rep, so I really feel that I am on top of things." Moreover, brochures, demonstrations, and company visits help reduce technological and investment uncertainty and create an "atmosphere of trust." Many respondents feel that because of the fact that the VHV copier represents the heart of their core business they are in, the same business and that cooperative effort at improving the technology from the customer's viewpoint often creates the feeling of being in the same boat together. We hypothesise that:

H4: The relationship characteristics are positively related to trust.

H5: The relationship characteristics are positively related to affective commitment.

Perceived dependence and switching risks and costs are factors that are taken into consideration in vendor switching decisions, although many respondents indicate that the costs of training key operators and the replaceability should not be overestimated in reference to the size of the investment involved. Nevertheless, relationship dissolution expenses influence cost–benefit calculations. In addition, a relatively large number of respondents indicate that relationship termination costs also would involve getting used to a new business partner (and leads to the fact that the ongoing relationship is viewed as important on a personal basis also). We hypothesise that:

H6: The market characteristics are positively related to affective commitment.

H7: The market characteristics are positively related to calculative commitment.

In terms of consequences of commitment and trust, we find that particularly personal relations and also credibility (both of the product and of the supplying organisation) and cost–benefit analyses play a role of importance in determining whether a customer will renew the contract with the present supplier and remain in the relationship. Finally, therefore, we hypothesise that:

H8: Trust is positively related to the intention to stay.

H9: Affective commitment is positively related to the intention to stay.

H10: Calculative commitment is positively related to the intention to stay.

The conceptual model tested in this study is depicted in Figure 1.

Study II: Testing of Hypotheses

DATA COLLECTION. To test the aforementioned hypotheses, we undertook a large-scale quantitative study in the VHV market. The sample for this study includes 1,490 firms at which at least one VHV copier was used at the time of the sampling. A personalized cover letter on University stationery and a postage-paid return envelope accompanied the questionnaires. The cover letter explained the purpose of the study and the confidentiality of the responses. Respondents were offered a present to encourage their participation.

Twenty-five sets of questionnaires were undeliverable, leaving an effective sample of 1,465 questionnaires. Five hundred and four questionnaires were received, which is a response rate of 34%. After elimination of questionnaires from which excessive amounts of data were missing (>50% of data points), the final sample consisted of 491 respondents. Respondents that were not willing to participate in the mail survey were asked to answer an abbreviated telephone survey to obtain insight into nonresponse bias. No significant differences between respondents and nonrespondents regarding characteristics and attitudes were discovered by means of applying t-tests ($P = 0.01$). Furthermore, a time trend extrapolation test was performed. The assumption of such a test is that respondents who respond less readily are more like nonrespondents [58]. No significant t-test differences ($P = 0.01$) were found between early and late respondents on any of our constructs nor on the background variables. Our sample varied adequately in terms of the most important background characteristics. The distribution for the suppliers of the copiers appeared to be a good representation of the real market shares. The volume of copies made on the main copier ranged from 12,000 to 1,500,000 copies per month. The firms in the sample varied in terms of industry (government, 31%; education,

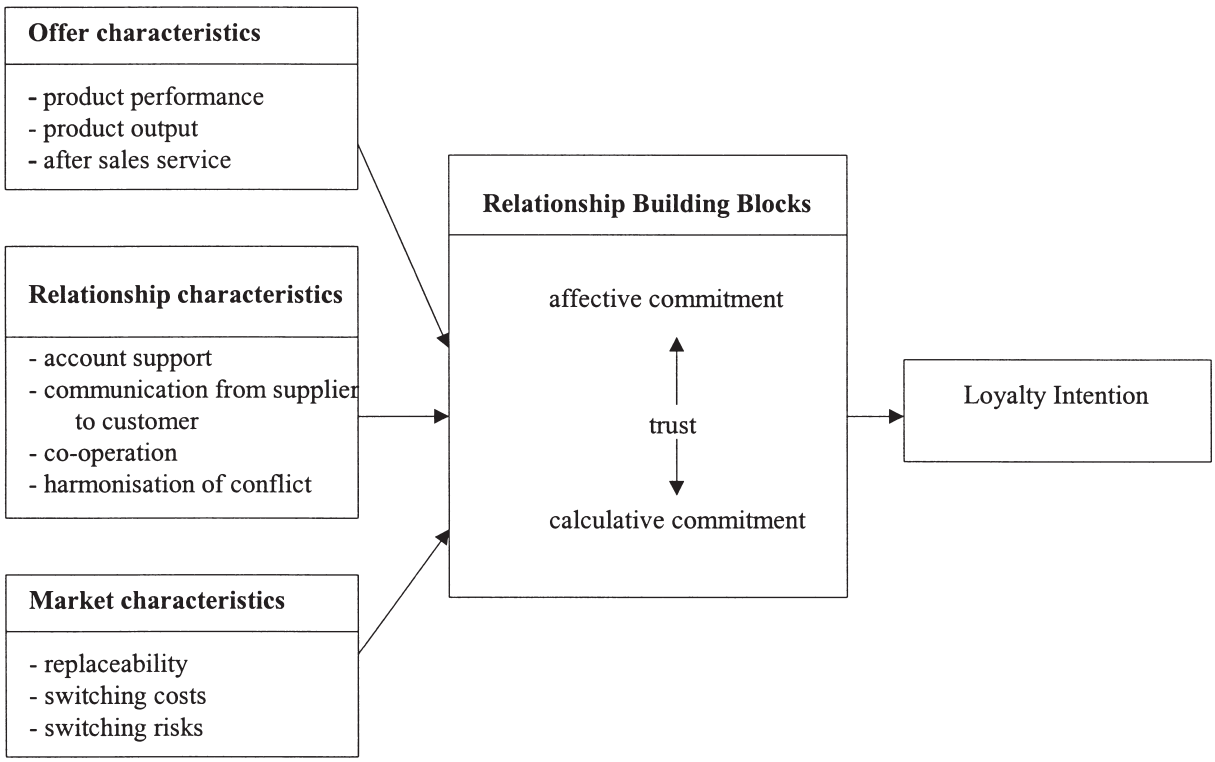

FIGURE 1. Conceptual model.

22%; services, 16%; reprographic industry, 10%; and others, 22%), length of the relationship (relationship that lasted longer than 15 years, 21%; relationship between five and 10 years, 46%; relationship less than five years, 33%), and position of respondent in the firm (manager of reprographic department, 22%; facility manager, 22%; employee in reprographic department, 20%; purchasing manager, 11%; general director, 9%; and others, 15%).

MEASURES. Each construct in the model is measured using a multiple-item measurement scale. Nearly all measures use a seven-point Likert-type response format, with "strongly disagree" and "strongly agree" as the anchors. Some items in the questionnaire were reverse coded to detect response bias.

For the measurement of trust ($\alpha = 0.94$) we used three items based on Anderson and Narus [24]. Affective commitment ($\alpha = 0.87$) and calculative commitment ($\alpha = 0.79$) each were measured by three items based on the construct definitions and scales from Kuma, Hibbard and Stern [22]. With regards to offer characteristics, product performance ($\alpha = 0.70$) and product output ($\alpha = 0.79$) each were assessed with three items specifically designed for this study. The after-sales service ($\alpha = 0.93$) is measured with 12 items on the basis of scales reported by Swan et al. [59] and Williams and Semenerio [60]. Account support (16 items, $\alpha = 0.94$) is based on scales from MacKenzie [33] and Ganesan [20]. The four-item scale used to measure the communication from the supplier to the customer ($\alpha = 0.78$) was developed by Anderson and Weitz [45]. The measures for harmonization of conflict ($\alpha = 0.86$, three items) and cooperation ($\alpha = 0.78$, three items) are based on scales developed by Anderson and Narus (1990) [24]. Market characteristics are measured with three subscales. Replaceability ($\alpha = 0.86$) contains a selection of six items from the eight-item scale from Ganesan [20]. The three-item scale for switching costs ($\alpha = 0.75$) is adapted from Heide and Weiss [7]. The measurement of switching risks ($\alpha = 0.72$) is based on a three-item scale from Shimp and Bearden [61]. Finally, intention to stay ($\alpha = 0.75$, three items) is based on a scale developed and validated by Kumar, Hibbard, and Stern [22].

The three types of antecedents were measured with multidimensional measures (cf. [62, 63]). This means that we use subscale scores rather than individual items as indicators of these latent variables. In this way, the problem of fitting models with more that 30 manifest indicators (in our study we had 68 indicators or items) in a structural equation modeling approach could be dealt with [63, 64]. Second, a sample size to parameter ratio of five or more is needed to achieve reliable estimates in maximum likelihood estimation [65]. Because we have only a moderate sample size, a parsimonious estimation strategy is most appropriate (cf. [63]). We mainly used (sub)scales that showed internal consistency in previous research. Items were adapted to the specific characteristics of our research setting on the basis of the interviews. Appendix 1 contains sample items of the questionnaire that was used in this study.

CONSTRUCT VALIDATION. To test the integrity of the antecedent constructs that we used in our study, we decided to use their respective subscales as manifest indicators of the antecedents. This decision was supported on the basis of favorable reliability properties as well as preliminary exploratory factor analyses. To evaluate in which degree our data fit the hypothesized antecedent structure, we performed a confirmatory factor analysis with LISREL VII. Thus, we used the subscales as multiple manifest indicators of the three antecedents. The results of this analysis are reported in Table 1.

Due to the sensitivity of the χ^2 value to the sample size, the χ^2 statistic is not an appropriate measure of the goodness-of-fit of the measurement model [66–68]. Therefore, we mainly rely on criteria that are independent on sample size, such as the Tucker-Lewis Index (TLI) [69, 70]. Additionally, we present some alternative measures, such as the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the root mean square residual (RMSR) [68] and the normed fit index (NFI) [70].

It can be concluded on the basis of these measures that the model has an adequate fit. All measures well exceed their recommended levels [68, 71]. The relationships between each indicator variable and its respective latent variable is statistically significant ($P < 0.001$, all t-values >5) and all standardized factor loadings are greater than 0.4. Furthermore, the Q-plot clearly shows a linear trend through the plotted values indicating a good fit [68, 71]. Finally, only a small proportion of the modification indices exceeds the value of 5.

HYPOTHESIS TESTING. To test the hypotheses, we used path analysis with observable (manifest) variables by using PRELIS and LISREL 8 [68]. We used LISREL to obtain maximum likelihood estimates of the standardized path coefficients. It can be concluded that the fit of this model is good: $\chi^2 = 30.61$, df = 7; GFI = 0.98, AGFI = 0.93, RMSR = 0.03. All goodness-of-fit measures well exceed the recommended cut-off values [68,

TABLE 1
Results of Confirmatory Factor Analysis for Antecedent Items*

	Offer Characteristics	Relationship Characteristics	Market Characteristics
Indicator			
Product performance	0.76 (17.10)		
Product output	0.71 (15.59)		
After-sales service	0.80 (18.27)		
Account support		0.81 (18.65)	
Communication from supplier to customer		0.71 (15.72)	
Harmonization of conflict		0.45 (9.01)	
Cooperation		0.66 (14.43)	
Replaceability			0.64 (11.48)
Switching costs			0.80 (13.59)
Switching risk			0.45 (8.35)
Reliability	0.80	0.76	0.67
χ^2	129.14 ($P < 0.001$)		
df	32		
GFI	0.95		
AGFI	0.91		
RMSR	0.06		
TLI†	0.91		
NFI†			

*Standardized loadings in cells and corresponding t-values in parentheses.
†Null model assumes no underlying factors.

71]. Furthermore, the values of the χ^2/df ratio also indicate a good fit of the data to the hypothesized model [71, 72]. Inspection of the standardized residuals showed that none of these exceeded the absolute value of 2.58, the cutoff value suggested by Jöreskog and Sörbom [68]. Finally, the Q-plot clearly showed a linear trend through the plotted values indicating a good fit [68, 71]. Inspection of the path coefficients allows us to test our hypothesis.

Hypothesis 1 is supported by a significant positive relationship between trust and affective commitment (standardized path coefficient = 0.27; t-value = 5.50). Customer confidence contributes to the way in which clients feel about the relationship with their supplier. We find a significant negative relationship between trust and calculative commitment, which supports hypothesis 2 (standardized path coefficient = −0.15; t-value = −3.45). The lower the degree of trust in a relationship, the more the partners will be calculatively committed to the relationship. With regards to trust we find positive relationships with offer and relationship characteristics. Both supplier variables apparently contribute to customer confidence (standardized path coefficient = 0.27; t-value = 7.08, 0.52, and 13.49, respectively). This signifies that we can accept both hypotheses 3 and 4.

Significant positive relationships were found between relationship characteristics and affective commitment (standardized path coefficient = 0.29; t-value = 5.79) and market characteristics and affective commitment (standardized path coefficient = 0.26; t-value = 7.06). Hence, we accept hypotheses 5 and 6. As expected, market characteristics also have a positive effect on calculative commitment (standardized path coefficient = 0.42; t-value = 9.89). Therefore, hypothesis 7 is supported.

We found positive causal relationships between affective commitment, trust, and calculative commitment and intention to stay. We therefore accept hypotheses 8, 9, and 10.

Interestingly, inspection of the modification indices suggested one additional relationship in our model [68]. In addition to the relations hypothesized *a priori*, it was found that offer characteristics has a significant positive effect on intention to stay (standardized path coefficient = 0.17; t-value = 4.00). Thus, the more offer characteristics is evaluated as positive, the more customers will be inclined to remain in the relationship with their supplier. Table 2 and Figure 2 summarize the results of our analysis.

CONCLUSIONS

Discussion

Relationships in high-technology markets are a complex phenomenon. As Morgan and Hunt [21] and Wilson

TABLE 2
Results of Path Analysis*

	Hypothesis	Standardized Path Coefficient†
Relationship		
Trust → affective commitment	H_1	0.27 (5.50)
Trust → calculative commitment	H_2	−0.15 (−3.45)
Offer characteristics → trust	H_3	0.27 (7.08)
Relationship characteristics → trust	H_4	0.52 (13.49)
Relationship characteristics → affective commitment	H_5	0.29 (5.79)
Market characteristics → affective commitment	H_6	0.26 (7.06)
Market characterisitcs → calculative commitment	H_7	0.42 (9.89)
Affective commitment → intention to stay	H_8	0.38 (9.53)
Trust → intention to stay	H_9	0.24 (5.25)
Calculative commitment → intention to stay	H_{10}	0.14 (4.15)
Offer characteristics → intention to stay		0.17 (4.00)
χ^2	30.61 ($P < 0.001$)	
df	7	
GFI	0.98	
AGFI	0.93	
RMSR	0.031	
TLI†	0.94	
NFI†	0.97	

*Standardized loadings in cells and corresponding t-values in parentheses.
†Null model assumes no relationships between variables.

[6] suggest, commitment and trust are central constructs in marketing relationships. To achieve customer commitment and trust, suppliers of high-technology products have to invest in diverse areas. In this article, we developed a model in which three critical areas of relationship-specific investments are discerned and taken into account simultaneously. With respect to antecedents of affective commitment, our results provide support for a positive

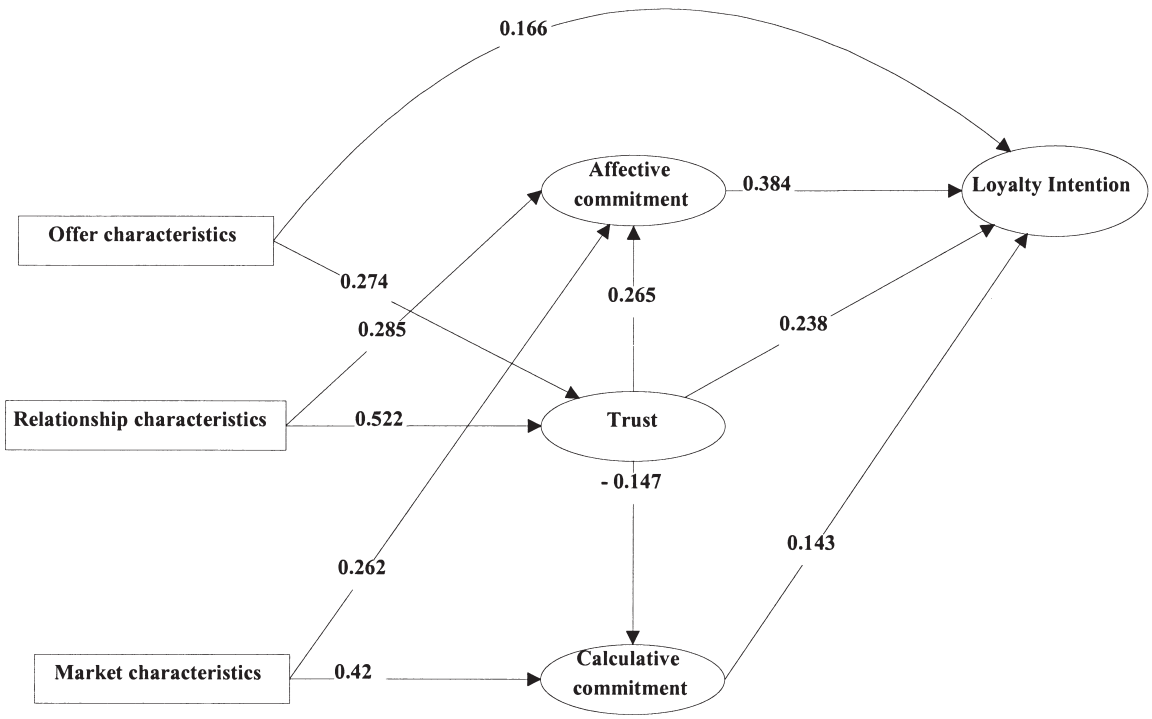

FIGURE 2. Path diagram for structural model.

relationship between the relationship characteristics and affective commitment. This means that activities aimed at managing the relationship with customers contribute to a perception of an enjoyable relationship. Similarly, trust has a positive impact on affective commitment in supplier–customer relationships in high-technology markets. This is in line with the results from previous research [17, 19, 21, 25, 73]. Trust pertains to a customer's confidence and faith that the supplier will be reliable and willing to listen to the customer's wishes and act in his best interests. Rempel and Holmes [74] argue that trust results in a positive attitude towards the exchange partner in relationships that is reflected in affective commitment. Finally, we find a positive relationship between market characteristics and affective commitment. Although this finding is in line with the results from previous studies [20, 23, 56], it still may seem counterintuitive. The positive relationship between market characteristics and affective commitment in high-technology markets may be explained as follows. It may be indicative of the fact that due to the limited number of suppliers, a high degree of dependence and high switching costs and risks, suppliers of high-technology products, and services may have a relatively powerful position in the market, often as a single source supplier. Frazier, Gill, and Kale [75] conted that in such situations the powerful party does not have to resort to coercive measures to ensure well-functioning relationships but instead use noncoercive strategies that result in an exchange atmosphere that is perceived as positive and agreeable by the more dependent partner in the relationship. Kumar, Sheer, and Seenkamp [56] argue that such a positive exchange atmosphere may enhance parties to remain in a relationship on the basis of affection.

With respect to trust, we find that both offer characteristics and relationship characteristics have a positive impact on this relationship variable. In the context of the market for high-technology products, customers must necessarily rely on suppliers to give "credence" to the product offering as their information and knowledge largely depends on the supplier's efficacy. In addition to product-related criteria, service and account support are often cited as major reasons for choosing a supplier in high-technology markets. Furthermore, relationship managing activities by suppliers often are geared towards achieving the customer's confidence by information sharing, cooperative synergy, and lowered levels of perceived risk. For instance, an open information exchange in which proprietary data is shared will instigate customers to work more closely with their supplier and to share their information too.

We find that calculative commitment is relatively strongly determined by market characteristics. As a relatively large degree of dependence exists in high-technology markets, the motivation to protect idiosyncratic investments in the relationship with a supplier would be in the interest of the customer. The relative impact of market conditions also can be accounted for by the fact that there are likely to be few alternatives that can replace the current supplier in the market. On the other hand, we find a negative relationship between trust and calculative commitment. The less a customer will have confidence in the supplier, the more the motivation will be based on a calculation of costs and benefits.

In terms of the consequence of our relationship variables, our results provide support for the positive impact of the three variables on the intention to remain in the relationship. Our study provides evidence for the relatively important role of affective commitment in business relationships. Due to the complexity of relationships (relatively high uncertainty as well as large investments), all three variables play a role of some importance. The decision to remain in the relationship with the supplier will be based on affective as well as cognitive motivations. We also encounter a direct effect of offer characteristics on the intention to continue the relationship. At the heart of the purchase decision process lies an inventarization of product features that a customer desires from a new product. The centrality of product characteristics may be an important reason why offer characteristics has a direct impact on intention to stay.

Implications

The results of our investigation have implications for theory and for practice. In the theoretical domain implications follow from the acknowledgement of the limitations of our study. Whereas the approach by using the groups of antecedents broadens our perspective concerning the relevant issues involved in relationships in high-technology markets, it narrows our view due to the fact that only a limited number of variables could be specified as antecedents. Future research should be directed at including other aspects of supplier–customer relationships, such as social closeness, goal congruence, and price. Second, the generalizability of our study should be treated with discretion. Although our model has the potential of application to other complex vendor–client situations, it has to be kept in mind that our results pertain only to a highly specialized and idiosyncratic setting. Third, all

concepts were measured at one point in time, thus essentially from a static perspective. It may be worthwhile to study supplier–customer relationships in high-technology markets over time to be able to take into account the dynamics of business relationships. Moreover, should such an approach be taken, measures of actual behavior and objective performance (e.g., switching behavior, vulnerability to price competition, and relative market share) in addition to perceptual gauges could be taken into account. Fourth, previous research has suggested additional types of commitment in business relationship, such as moral commitment [56, 76]. Since the operationalization in our design has been limited to affective and calculative, the obvious implication is to incorporate other types of commitment, particularly in research settings in which affective nor calculative commitment play a role of importance. Finally, in our model we neglect the supplier perspective on the relationship. Relationships are of a dyadic nature and are best operationalized by incorporating more than one contributor. This also would ecrease the likelihood of common method variance response bias. In future studies, the research could be complemented by internal measurements, for example, by contacting employees or management of the supplier and measure their relationship perceptions too.

Our results also suggest a number of managerial implications. First, the impact of the three types of antecedents on the relationship building blocks is not to be neglected. In essence. the offer characteristics, relationship characteristics, and market characteristics make up the scope of management decision making, ranging from tactical product-related decisions to strategic competitor-related decisions. The offer characteristics can be considered as the augmented product, including the intrinsic elements of the product as well as, for instance, performance, output, and after-sales service. Usually, these decisions are made in a relatively short period of time, and adaptations and changes with regard to these characteristics can be made relatively easy and without structural changes within the organization, for example. changes in service contracts and technical performance improvements. Effects of changing these characteristics are found mainly in increased customer trust and loyalty.

Since affective commitment and trust play such an essential role in customer relationships, marketers of high-technology products are advised to emphasize activities and initiatives that promote positive feelings of affiliation. Long-term relationships with customers can provide all kinds of advantages for suppliers. In return, for the firm there is a constant pressure on research and development departments to, for example, develop new and innovative products, facilities, or flexible service contracts. Furthermore, emphatic behavior might be important in contacts with customers, especially in cases where there is no acute problem. Service staff should try to act proactively in their advice to customers. On the basis of their superior knowledge of the (innovative) products, it should be possible to provide customers with new product and service solutions that are mutual beneficial. A suggestion might be to invite customers to new product introductions and product demonstrations to create a cooperative atmosphere. Even letting customers share social events of the firm might be an alternative way of creating affective commitment through emotional experiences. Examples of these kinds of experiences are main sponsored sports events, art exhibitions, and music performances. One finding of our study is unequivocal: to realize those advantages high-tech firms should emphasize activities that produce positive feelings of affiliation. For instance, when hiring sales and service personnel firms should screen applicants (who often have a technical background) for the social abilities that facilitate establishing and maintaining long-term relationships based on affective commitment. Furthermore, all personnel should recognize their role as salespeople representing complex bundles of services and view themselves as relationship managers.

In the market for high-technology products and services in which a high emphasis is placed on integrated networks between suppliers and customers and competition takes place in a dynamic environment, commitment, trust, and related issues are likely to play a crucial role. Changing or adapting strategies for a company usually encompasses a myriad of decisions, and therefore these changes are not easy to be made. In considering the scope and relative impact of possible tactical and strategic decisions, management will be able to select and fine-tune the right characteristics to improve customer relationships and loyalty of the existing customer base. It is hoped that our study provides a small contribution to a better understanding of these issues.

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APPENDIX 1
Sample Items

Construct	Sample Item
Trust	Our supplier is a firm that stands by its word.
Affective commitment	It is pleasant working with our supplier; that's why we stay with our supplier.
Calculative commitment	Ther is just too much time, energy, and expense involved in terminating our relationship with this supplier.
Intention to stay	We expect our relationship with our supplier to last long.
Offer characteristics	
Product performance	The percentage of malfunctions of the VHV copier.
Product output	The quality of copies of the VHV copier.
After-sales service	When our supplier provides service, it is done correctly the first time.
Relationship characteristics	
Account support	We can rely on the promises made by the account manager.
Communication	There is excellent communications between our firms so there are never any surprises that might be harmful to our working relationship.
Harmonisation	In case of conflict our supplier does not attempt to come up with a constructive solution
Cooperation	This supplier and our firm actively work together as partners.
Market characteristics	
Replaceability	There is really no alternative for this supplier of VHV products.
Switching costs	We believe that it would be a very time-consuming process to build a relationship with a new supplier of VHV copiers.
Switching risk	Considering the sizeable investment associated with the purchase of a VHV copier, switching to another supplier would involve a great risk.